

**APPLICATION**  
**FOR**  
**UNITED STATES LETTERS PATENT**

**TITLE:** **EXAMINATION AND TREATMENT CHAIR**  
**APPLICANTS:** Charles Brockway and Donald Lietzenmayer  
**ASSIGNEE:** Midmark Corporation

Wood, Herron & Evans, L.L.P.  
2700 Carew Tower  
441 Vine Street  
Cincinnati, Ohio 45202  
(513) 241-2324 - Office  
(513) 421-7269 - Facsimile  
WHE Ref. No.: MIDTF-306P2

**SPECIFICATION**

09978006-10101

## **EXAMINATION AND TREATMENT CHAIR**

### **Field of the Invention**

The present invention relates generally to articulated chairs and, more particularly, to an articulated chair operable to move between a generally upright patient entry/exit position and a reclined patient examination and treatment position.

### **Background of the Invention**

Articulated examination and treatment chairs are used to position a patient to a variety of different positions which may be selected in accordance with the particular procedure being performed and with reference to the preferences of the particular operator or doctor. For dental procedures, by way of example, the chair may be moved between a generally upright patient entry/exit position and a reclined patient examination and treatment position.

The chair has a seat section and a back section that provide a comfortable support surface for the patient throughout movement of the

chair. Arm rests are provided on opposite sides of the chair to support the patient's arms as the chair is moved through the various positions. To provide patient comfort, the arm rests must move or tilt to accommodate the change in position of the patient as the patient moves through the various positions. To accomplish this need, arm rests have either been connected for pivotal movement with the seat section or the arm rests are pivotally connected to the back section through a rotatable shaft and linkages.

In the generally upright patient entry/exit position of known examination and treatment chairs, the arm rests obstruct the patient's entry into or exit from the chair. Therefore, the arm rests are constructed either to be temporarily removed or to pivot out of the way to allow patient to enter or exit the chair. Either of these solutions has a tendency to be cumbersome, especially for handicapped and elderly patients.

Therefore, there is a need for an chair that improves patient entry or exit while providing comfort to the patient during movement of the chair between entry/exit and examination and treatment positions.

#### **Summary of the Invention**

The present invention overcomes the foregoing and other shortcomings and drawbacks of examination and treatment chairs heretofore known. While the invention will be described in connection with certain embodiments, it will be understood that the invention is not limited to these embodiments. On the contrary, the invention includes all

alternatives, modifications and equivalents as may be included within the spirit and scope of the present invention.

09976006-101204

An examination and treatment chair in accordance with the principles of the present invention is operable to move between a generally upright patient entry/exit position and a reclined patient examination and treatment position. The chair includes a chair support for supporting a seat section and back section of the chair. The back section is mounted for pivotal movement relative to the chair support between a generally upright position and a reclined position. A pair of arm rests are rigidly connected to the back section for movement with the back section between the generally upright position and the reclined position.

In accordance with the principles of the present invention, the arm rests are automatically positioned to allow a patient unobstructed entry into or exit from the chair when the back section is moved to the generally upright position. The arm rests are automatically positioned to support the patient's arms when the back rest is moved to the reclined position.

In accordance with one aspect of the present invention, the back section includes a back frame and a back cushion supported on the back frame. The arm rests may be integrally formed with the back frame such as by a unitary casting of the back frame and the arm rests or, alternatively, the arm rests may be rigidly connected to the back frame. The back frame and foam cushion are dished so that the arm rests and the dished or contoured back section comfortably cradle the patient in a natural, relaxed position to maximize patient comfort and reduce patient anxiety.

09976006-104204

The chair of the present invention provides a patient with unobstructed entry into or exit from the chair in the generally upright patient entry/exit position and a natural, relaxed and comfortable support in the reclined patient and treatment position. The foam cushion provides patient comfort in the lumbar region of the patient's back and forces the patient's shoulders back, which naturally elevates the patient's chin and puts the patient in a good working position.

The above and other objects and advantages of the present invention shall be made apparent from the accompanying drawings and the description thereof.

#### **Brief Description of the Drawings**

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with a general description of the invention given above, and the detailed description of the embodiments given below, serve to explain the principles of the invention.

Fig. 1 is a side elevational view of an articulated examination and treatment chair in accordance with the principles of the present invention, illustrating the chair in a generally upright patient entry/exit position;

Fig. 2 is a view similar to Fig. 1, illustrating the chair in a reclined patient examination and treatment position;

Fig. 3 is a perspective view of the chair in the reclined patient examination and treatment position with seat and back cushions removed;

Fig. 4 is a disassembled view of a back cushion including a cushion pan and a foam cushion; and

Fig. 5 is an partial disassembled view illustrating connection of the back section to a chair support and drive linkage of the chair.

## 5 **Detailed Description of the Preferred Embodiment**

With reference to the Figures, and to Figs. 1-3 in particular, an articulated examination and treatment chair 10 is shown in accordance with the principles of the present invention for moving between a generally upright patient entry/exit position (Fig. 1) and a reclined patient and treatment position (Fig. 2). As will be described in detail below, the chair 10 provides a patient with unobstructed entry into or exit from the chair 10 in the generally upright patient entry/exit position and a natural, relaxed and comfortable support in the reclined patient examination and treatment position.

Further referring to Fig. 1-3, the chair 10 includes a chair base 12 secured to a support structure, such as a floor, a conventional lift arm 14 having one end connected to the chair base 12, and a chair support assembly 16 for rotatably supporting a seat section 18 and a back section 20 of the chair 10 on the opposite end of the lift arm 14. As shown in Fig. 3, the chair support assembly 16 includes a yoke member 22 supported on the lift arm 14 in a conventional manner for pivotally supporting a back frame 24 of the back section 20. A seat support 26 is mounted to the lift arm 14 for pivotally supporting a seat frame 28 of the seat section 18.

In accordance with the principles of the present invention, the back frame 24 may comprise a dished or contoured unitary casting including a pair of arm rests 30 that are positioned on opposite sides of the back frame 24. Alternatively it will be appreciated by those of ordinary skill in the art that the arm rests 30 may be rigidly affixed to the back frame 24 without departing from the spirit and scope of the present invention.

A dished or contoured back cushion 32 (Fig. 4) is mounted within the back frame 24 and includes a rigid pan 34 made of plastic or other rigid or semi-rigid material to which a foam cushion 36 is adhered or otherwise secured. The foam cushion 36 includes an elongated cavity 38 formed in the back of the foam cushion 36 to provide patient comfort in the lumbar region of the patient's back. The foam cushion 36 has an increased thickness at the lumbar region to force the patient's shoulders back which naturally elevates the patient's chin and puts the patient in a good working position. The depths of the back frame 24 and the foam cushion 36 are relatively thin near the top of the back section 20 to reduce interference between the chair operator and the back section 20 in the reclined examination and treatment position of the chair 10. The arm rests 30 and dished or contoured back section 20 comfortably cradle the patient in a natural, relaxed position. In addition, the back section 20 supports an articulating headrest 40 extending above the back section 20 for comfortably supporting a patient's head. Other headrest structures, such as non-articulating with pillow, are possible as well.

As shown in Figs. 3 and 4, the pan 34 has multiple keyhole slots 42 that slidably receive buttons 44 projecting outwardly from the back frame 24. To install the pan 34 and foam cushion 36 to the back frame 24, the keyhole slots 42 are aligned with the buttons 44 and the pan 34 is then lowered to engage the buttons 44 with the keyhole slots 42. A pair of fasteners (not shown) extend through apertures 46 in the arm rests 30 (Fig. 3) and engage apertures 48 in the pan 34 (Fig. 4).

As shown in Figs. 3 and 5, a pair of pivot extensions 50 are located beneath the arm rests 30 and are pivotally connected to upstanding arms 52 of the yoke member 22 at pivotal connections 53 through shoulder screws 54, bearing sleeves 56 and washers 58 (see Fig. 5). The pivotal connections of the back frame 24 to the yoke member 22 permit the back frame to pivot between a generally upright position (Fig. 1) and a reclined position (Figs. 2 and 3).

Further referring to Fig. 3, a drive mechanism 60, such as a hydraulic cylinder, is operatively connected to the back frame 24 through a pair of curved links 62. As shown in Figs, 3 and 5, the curved links 62 are each pivotally connected at one respective end to a pivot extension 64 located at a lower end of the back frame 24. The curved links 62 are connected to the pivot extension 64 through shoulder screws 66, bearing sleeves 68 and washers 70 (Fig. 5). Respective opposite ends of the curved links 62 are operatively connected to a drive arm (not shown) of the drive mechanism 60 through a block 74 (Fig. 3) connected between respective ends of the curved links 62.

09975006-101301

The seat frame 28 is pivotally connected at one end to a pair of brackets 76 through pivotal connections 78 so that the foot end of the seat frame 28 is free to pivot or lift about the pivotal connections 78. A pair of lift arms 80 are mounted within a slide assembly 82 and have  
5 respective ends connected to respective ends of the curved links 62. Opposite respective ends of the lifts arms 80 operatively engage the seat frame 28 to lift the foot end of seat section 18 during movement of the chair 10 to the reclined patient examination and treatment position.

In use, as shown in Fig. 1, the chair 10 is first moved to the  
10 generally upright patient entry position through operation of a touchpad control 84 located on the side of the chair 10 or a foot control (not shown). The drive mechanism 60 extends the drive arm (not shown) which causes the back section 20 to pivot about the pivotal connections 53 (Fig. 3) to the generally upright position shown in Fig. 1. Extension of the drive arm (not  
15 shown) simultaneously causes the lift arms 80 to retract so that the foot end of the seat section 18 is lowered about the pivotal connections 78 (Fig. 3) to the position shown in Fig. 1. The seat section 18 has a pair of notches (not shown) formed in its opposite sides remote from the foot end that allow the arm rests 30 to pivot within the notches (not shown). In the  
20 generally upright patient entrance position as shown in Fig. 1, the arm rests 30 move with the back section 20 and are automatically positioned to allow the patient unobstructed entry into or exit from the chair 10.

After the patient has entered the chair 10, the chair 10 is moved to the reclined patient examination and treatment position through

operation of a touchpad control 84 or foot control (not shown). The drive mechanism 60 retracts the drive arm (not shown) which causes the back section 20 to pivot about the pivotal connections 53 (Fig. 5) to the reclined position shown in Fig. 2. Retraction of the drive arm (not shown)

5 simultaneously causes the lift arms 80 to extend so that the foot end of the seat section 18 is raised about the pivotal connections 53 (Fig. 5) to the position shown in Fig. 2 and 3. In the reclined patient examination and treatment position as shown in Fig. 2, the arm rests 30 move with the back section 20 and are automatically positioned to comfortably support the  
10 patient's arms.

The chair 10 of the present invention provides many benefits. The chair 10 provides a patient with unobstructed entry into or exit from the chair 10 in the generally upright patient entry/exit position and a natural, relaxed and comfortable support in the reclined patient examination  
15 and treatment position. This is particularly important to accommodate elderly or handicapped patients. The foam cushion 36 provides patient comfort in the lumbar region of the patient's back and forces the patient's shoulders back which naturally elevates the patient's chin and puts the patient in a good working position. In addition, the arm rests 30 and dished  
20 or contoured back section 20 comfortably cradle the patient in a natural, relaxed position to maximize patient comfort and reduce patient anxiety.

While the present invention has been illustrated by a description of various embodiments and while these embodiments have been described in considerable detail, it is not the intention of the applicants

to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. The invention in its broader aspects is therefore not limited to the specific details, representative apparatus and method, and

5 illustrative example shown and described. Accordingly, departures may be made from such details without departing from the spirit or scope of applicants' general inventive concept.

Having described the invention, WE CLAIM: